



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : H04Q 7/24		A1	(11) International Publication Number: WO 96/13949
			(43) International Publication Date: 9 May 1996 (09.05.96)
<p>(21) International Application Number: PCT/FI95/00601</p> <p>(22) International Filing Date: 31 October 1995 (31.10.95)</p> <p>(30) Priority Data: 945151 1 November 1994 (01.11.94) FI</p> <p>(71) Applicant (for all designated States except US): NOKIA TELECOMMUNICATIONS OY [FI/FI]; Mäkkylän puistotie 1, FIN-02600 Espoo (FI).</p> <p>(72) Inventors; and</p> <p>(75) Inventors/Applicants (for US only): HUOTARI, Seppo [FI/FI]; Harakankuja 6 E 33, FIN-02600 Espoo (FI). TURKULAINEN, Veli [FI/FI]; Korsitie 2 H 16, FIN-00730 Helsinki (FI).</p> <p>(74) Agent: OY KOLSTER AB; Iso Roobertinkatu 23, P.O. Box 148, FIN-00121 Helsinki (FI).</p>		<p>(81) Designated States: AL, AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TT, UA, UG, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, LS, MW, SD, SZ, UG).</p> <p>Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</p>	
<p>(54) Title: METHOD FOR ACTIVATING INTELLIGENT NETWORK SERVICES IN A MOBILE COMMUNICATION SYSTEM, AND A MOBILE COMMUNICATION SYSTEM</p> <p>(57) Abstract</p> <p>The invention relates to a mobile communication network and a method for activating intelligent network services in the mobile communication network. In the invention, the mobile services switching center (MSC) operates as the service switching point of the intelligent network. The mobile services switching center stores the service triggers, which service triggers comprise the triggering criteria for the services and the information required for visiting the service control point (SCP). The mobile subscriber's subscriber data in the subscriber database (HLR) is provided with an intelligent network service trigger key which points to one or more service triggers. As the mobile services switching center obtains the trigger key of the mobile subscriber during the call setup, it activates the service triggers indicated by the key. As the triggering criteria of the service trigger are met at some phase of the call, the mobile services switching center triggers the respective intelligent network service in the service control point (SCP) indicated by the service trigger.</p>			
<pre> graph TD GMSC[GMSC] -- "PSTN PSPDN ISDN" --> PSTN[PSTN] GMSC --> HLR[HLR] GMSC -.-> VMSC[VMSC+SSP] GMSC -.-> MSC[MSC] SCP[SCP] -.-> GMSC SCP -.-> VMSC SCP -.-> MSC SCP -.-> VLR[VLR] SCP -.-> BSC[BSC] SCP -.-> BTS1[BTS1] SCP -.-> BTS2[BTS2] SCP -.-> MS[MS] SMS[SMS] -.-> SCP SCE[SCE] -.-> SCP VLR -.-> MSC BSC -.-> BTS1 BSC -.-> BTS2 BTS1 -.-> MS BTS2 -.-> MS </pre>			

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgyzstan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SI	Slovenia
CI	Côte d'Ivoire	LI	Liechtenstein	SK	Slovakia
CM	Cameroon	LK	Sri Lanka	SN	Senegal
CN	China	LU	Luxembourg	TD	Chad
CS	Czechoslovakia	LV	Latvia	TG	Togo
CZ	Czech Republic	MC	Monaco	TJ	Tajikistan
DE	Germany	MD	Republic of Moldova	TT	Trinidad and Tobago
DK	Denmark	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	US	United States of America
FI	Finland	MN	Mongolia	UZ	Uzbekistan
FR	France			VN	Viet Nam
GA	Gabon				

Method for activating intelligent network services in a mobile communication system, and a mobile communication system

5 Field of the Invention

The present invention relates to a mobile communication system comprising at least one mobile switching center, mobile subscribers, at least one subscriber database and an intelligent network comprising at least one service switching point, and at least one service control point comprising the database and service logic programmes of the intelligent network, whereby the intelligent network contains predefined service triggers, each trigger defining triggering criteria for activating a respective intelligent network service in one of the service control points, and more particularly to activating of the intelligent network service in a mobile communication system.

20 Background of the Invention

In communication networks, intelligence relates to the ability to have access to stored data, to process it and to make decisions on the basis of the data. Even the present communication networks, such as public switched telephone networks (PSTN), are to some extent intelligent, because they are able to process stored data in relation with, for example, routing of calls. A typical "intelligent" facility in modern communication networks is a conditional call forwarding which requires an analysis of the call situation and routing the call forward on the basis of the stored service profile of the call forwarding. Such intelligent facilities have, however, been an integral part of the basic network, and have thus required, for example, software updating in all the network exchanges in cases of altering or increasing the number of facilities.

An Intelligent Network (IN) is a network architecture which can be incorporated in the basic network, and which makes implementation and controlling of services faster, easier and more flexible. This can be achieved by moving the service control out from the switching exchange into a separate functional unit of the intelligent network. This is how the services can be made independent of the operation of the basic network, and changes in the structure of the basic network or in the software are not required in conjunction with altering or increasing the number of services. In addition to the actual network operator, the intelligent network may contain several service providers.

In fixed networks, standardization of intelligent networks has been rapid in recent years. Standards of intelligent networks include the CCITT Q.1290 and prETS 300 374-1, Intelligent Network Capability Set 1 (CS1). These standards define a specific functional and hierarchical model for the intelligent network. In this model, service control is transferred from the exchange of the basic network to a service control point (SCP) in the intelligent network. The SCP comprises a database and service logic programmes (SLP), i.e. computer programmes which fulfil the logic structure of a specific programme (service logic). The intelligent network services are created, tested and withdrawn by means of special equipment referred to as service creation environment (SCE). Service management function (SMF) is used for management of subscriber and network information in the database, including service specific information and service programmes. The service switching point (SSP) is an exchange, for example that of the basic network, fulfilling the service switching function (SSF), in other words, the recognition of the intelligent network service and activation of interaction with the service control

point SCP.

For recognition and activation of an intelligent network service, the intelligent network contains predefined triggers for the service, the triggers defining 5 triggering criteria used for activation of the intelligent network service. The triggering criteria comprise, for example, the phase of the call routing, detection point (DP) according to the ETSI CS1 call model, which detection point is an event relating to call processing. If the 10 triggering criteria defined by the trigger are fulfilled, the intelligent network service is activated in a SCP defined by the trigger.

As stated above, the intelligent network standards have been developed for fixed communication networks. 15 There is no similar standardization for mobile communication networks. It is difficult to implement intelligent network functionality of the ETSI CS1 type, for example, in a mobile communication network in which mobile subscribers have no fixed access point in the 20 network. However, in every part of the mobile communication network it should be possible to recognize mobile subscribers using intelligent network services, have information on the services and triggers of each mobile subscriber, etc. This easily leads to massive data 25 files and/or large data transmission requirements within the mobile communication network.

Summary of the Invention

It is an object of the present invention to implement intelligent network functionality in a simple 30 way in a mobile communication network.

It is a further object of the present invention to activate an intelligent network service in a mobile communication network by loading the network as little as possible.

35 This is achieved by a mobile communication system

comprising at least one mobile switching center, mobile subscribers, at least one subscriber database and an intelligent network comprising at least one service switching point, and at least one service control point comprising the database and service logic programmes of the intelligent network, whereby the intelligent network contains predefined service triggers, each trigger defining triggering criteria for activating a respective intelligent network service in one of the service control points. The mobile communication system of the invention is characterized in that

the mobile services switching center operates as the service switching point of the intelligent network, and the service control point is implemented as a functional unit independent of the mobile services switching center, and communicates with the mobile services switching center by means of the intelligent network interface and the intelligent network protocol,

the subscriber data of a mobile subscriber entitled to intelligent network services in said at least one subscriber database includes a service trigger key pointing to one or more service triggers,

the mobile services switching center is arranged to react to the service trigger key of the mobile subscriber during call setup by retrieving one or more triggers pointed to by the trigger key, and by triggering an intelligent network service corresponding to said retrieved trigger in one of the service control points as the triggering criteria of the trigger are met.

The invention also relates to a method for activating an intelligent network service in a mobile communication network comprising at least one mobile switching center, mobile subscribers, at least one subscriber database and an intelligent network comprising at least one service switching point, and at least one

service control point comprising a database and service logic programmes of the intelligent network, the method comprising steps of

5 maintaining in the intelligent network predefined service triggers, each trigger defining triggering criteria for activating a respective intelligent network service in one of the service control points, characterized by providing the mobile subscriber entitled to intelligent network services with a trigger key which
10 points to one or more service triggers,

maintaining the triggers in the mobile services switching center so that they can be activated by the trigger keys,

15 activating in the mobile services switching center, in conjunction with an intelligent network call, those of the triggers pointed to by the trigger key of the mobile subscriber,

20 triggering the intelligent network service corresponding to the trigger in one of the service control points as the triggering criteria of the trigger are met in the mobile services switching center.

The invention utilizes the mobile services switching center as the switching point for an intelligent network service, providing access for the user of a mobile communication network to intelligent network services in a way independent of the service. The mobile services switching center communicates with the service control point by means of the standard interface of the intelligent network and the communication protocol. The mobile services switching center is able to recognize a call requiring an intelligent network service and to activate the intelligent network service in the service control point without any need for it to know the specific service. The mobile services switching center masters a set of basic functions of the intelligent network, which
35

are executed according to instructions from the service control point.

The mobile services switching center stores the triggers for the service, which triggers comprise the triggering criteria for the services and the information required for a visit to the service control point. The mobile subscriber's subscriber data is assigned with a trigger key for the intelligent network service, said trigger key pointing to one or more triggers for the service. As the mobile services switching center obtains the trigger key of the mobile subscriber during the call setup, it activates the triggers indicated by the key. As the trigger condition of the trigger at some phase of the call is fulfilled, the mobile services switching center triggers the intelligent network service indicated by the trigger in the service control point indicated by the trigger.

By the present invention, the signalling load caused by the intelligent network function does not increase, because in the mobile communication network it is only necessary to transfer the subscriber's trigger key which may, for example, be a numerical value. This new parameter can easily be included in the subscriber data nowadays transmitted in mobile communication networks. Each value of the trigger key points to one service package, i.e. to the trigger of the intelligent network service, or a combination of triggers, there being a relatively small and restricted number of them in use. The value of the trigger key thus depends on the desired service package, and may be the same for several subscribers. As a result, the mobile services switching center only needs to store, instead of subscriber specific service data, a relatively small and restricted number of triggers among which the triggers of the mobile subscriber are selected by means of the trigger key. As only the

triggering criteria, address of the service control point and the service key used for the recognition of the service associate the trigger with the actual intelligent network service, the operation of the mobile services switching center in recognition and activation of the intelligent network service is essentially independent of the service. The service provider may modify the service without changes in the triggers which are stored in the mobile services switching centers. A new service package can be added by allocating for it a free trigger key value which points to a desired trigger key or keys, and by notifying the mobile services switching center of the allocation as well as the possible new triggers.

Brief Description of the Drawings

In the following, the invention will be described in greater detail with reference to the accompanying drawings in which

Figure 1 shows a simplified diagram of a mobile communication system according to the invention,

Figure 2 shows a block diagram illustrating CS-1 IN architecture in a mobile communication system according to the invention,

Figure 3 shows a diagram illustrating the interrelation between a trigger key, service packages and triggers

Figures 4, 5 and 6 show event diagrams illustrating the use of the trigger key according to the invention in a mobile originating call in a VMSC, and in a mobile terminating call in a VMSC or GMSC.

The Preferred Embodiments of the Invention

In principle, the present invention can be applied to any mobile communication system, such as the Pan-European mobile communication system GSM (Global System for Mobile Communications), NMT (Nordic Mobile Telephone), DCS1800 (Digital Communication System), PCN (Personal

Communication Network), UMC (Universal Mobile Communication), UMTS (Universal Mobile Telecommunication System), FPLMTS (Future Public Land Mobile Telecommunication System), etc.

5 The GSM system is here used as an example to describe the preferred embodiments of the invention without, however, restricting the invention to it. Figure 1 very briefly illustrates the basic elements of the GSM system without going any further into the characteristics
10 of the elements or other subareas of the system. For a closer description of the GSM system, the GSM recommendations and "The GSM System for Mobile Communications", M. Mouly & M. Pautet, Palaiseau, France, 1992, ISBN:2-9507190-0-7 are referred to.

15 A mobile services switching center MSC handles the switching of incoming and outgoing calls. It carries out functions similar to those of an exchange of a public switched telephone network (PSTN). In addition to these, it also carries out functions characteristic of mobile communications only, such as subscriber location management in co-operation with the subscriber registers of the network. The calls between the mobile communication network and other communication networks, such as PSTN, PSPDN and ISDN, are routed through a gateway mobile services switching center GMSC. The mobile stations MS are connected to the center MSC by base station systems. The base station system consists of a base station controller BSC and base stations BTS.

20 As subscriber registers, the GSM system includes the home location register HLR and the visitor location register VLR. The subscriber data of the mobile subscriber are permanently maintained in the home location register HLR. The subscriber data are temporarily copied to that visitor location register VLR which the mobile subscriber
25 is visiting. There is typically one VLR for each mobile

services switching center MSC. The VLR and the MSC may be realized as one unit referred to by the abbreviation VMSC.

According to the invention, intelligent network functionality is so incorporated in the mobile communication system that the mobile services switching center VMSC functions as the service switching point SSP, and the service control point SCP comprising the service logic and data is outside the exchange as a separate functional unit. In accordance with Figure 2, the SCP comprises a database DB and service logic programmes SLP, i.e. computer programmes fulfilling the logic structure (service logic) of a specific service. In Figure 2, the SCP comprises n number of service logic programmes SLP. In addition, the SCP comprises a service control function SCF and a Core INAP protocol software for communication with the mobile services switching centers VMSC and GMSC. Other functional units of the intelligent network are connected to the SCP. The intelligent network services are created, tested and withdrawn by means of special equipment referred to as service creation environment SCE. A service management system SMS is used for controlling information concerning the users and the network in the database, including service specific information and service programmes.

The mobile services switching center VMSC functions as the service switching point SSP fulfilling the service switching function SSF, providing the user with access to intelligent network services in a way independent of the service. The VMSC/SSP is able to recognize a call requesting intelligent network service, which call may originate in a mobile subscriber MS located in the VMSC area, in a public switched telephone network PSTN, or in a private branch exchange PBX. The intelligent network call may, as a result of the intelligent network service, be routed towards a mobile subscriber, a public switched

telephone network PSTN, or a private branch exchange PBX. For reasons of clarity, Figure 2 only shows in the mobile services switching center VMSC the functional blocks necessary for describing the invention. It is, however, 5 obvious for a person skilled in the art that the VMSC comprises a lot of other units which are not, however, shown here. A suitable commercial mobile services switching center to which the present invention can be applied is the DX200 MSC manufactured by Nokia 10 Telecommunications.

In accordance with Figure 2, the VMSC/SSP comprises a call control function CCF, a service switching function SSF, a special resource function SRF, a visitor location register VLR and a MAP protocol software. The CCF takes care of normal call control of the mobile communication network, recognizes intelligent network calls, and informs the SSF of predetermined call phases. The CCF and the SSF communicate by using an internal interface. The special resource function SRF takes care of user interactive functions, such as announcements and reception of DTMF (Dual Tone Multi Frequency) codes. The SSF stores triggers for a service, and upon fulfilment of triggering criteria activates a desired intelligent network service in the SCP, as will be explained below. The VMSC/SSP also 15 comprises the Core INAP protocol software which the SSF uses for communication with the SCP by means of the standard interface and standard protocol of the intelligent network. The INAP protocol is described in the document prETSS300 374-1,1 Intelligent Network (IN); 20 Intelligent Network Capability Set 1 (CS1), Core Intelligent Network Application Protocol (INAP), Part 1, Protocol Specification. The MAP (Mobile Application Part) protocol takes care of communication between the call control function CCF, the visitor location register VLR and the home location register HLR. 25 30 35

For reasons of clarity, Figures 1 and 2 only show one VMSC/SSP and SCP, but it should be understood that there may be any desired number of said units in the mobile communication network. For example, each provider 5 of an intelligent network service may have a SCP of its own. The Core INAP protocol forms an open interface which can be used for connecting numerous units with each other. Also the gateway mobile services switching center GMSC may be of the VMSC/SSP type described above, forming, in 10 addition, a gateway to other communication networks.

Typically, intelligent network services offer some supplementary features to be paid for by the subscriber. Thus, it is obvious that handling of an intelligent network service is not involved in every call. The 15 intelligent network call handling capacity depends on the CCF capacity in the SSP and on the SCP capacity which can be increased by adding SCPs. Typical IN services that the present invention could support include, for example, virtual private network VPN, number translation services, 20 personal number PN, freephone service FPH, premium rate service PRM, originating call screening OCS, terminating call screening TSC, etc.

For recognition and activation of an intelligent network service, the intelligent network contains 25 predefined triggers for the service, the triggers defining the triggering criteria used for activation of the intelligent network service. According to the invention, the trigger file comprising the trigger record is stored in the mobile services switching center VMSC in the SSF block. One record comprises definitions that are required 30 in order to activate a specific IN service in a specific SCP. The trigger record may comprise, for example, the following fields:

- Service Key. The identification of the service 35 which is sent to SCP in Core INAP operations (for example,

Initial DP).

- Trigger status. ON/OFF. The trigger may temporarily be disabled without deleting the trigger record.

5 - Detection Point (DP). It defines the detection point DP in the basic call state model BCSM where the service will be triggered.

10 - SCP address source. It indicates where the call control point finds the SCP address. Possibilities: in trigger record/A-number/B-number.

15 - SCP address. This is used if the SCP address source = "in trigger record".

20 - Trigger priority. The trigger is given one of 16 priority classes. If there are several triggers active in the same detection point DP, they are triggered (detected) in the priority order.

25 - types of triggering criteria. The external conditions which influence the trigger decision. They include, for example, none/cause code/number of received digits/specific digit string/timer expiration.

30 - Logical operator between the triggering criteria: AND/OR.

- Triggering criteria.

35 - Failure activities: Continue call without SCP enquiry or release call with an announcement.

In the preferred embodiment of the invention, the intelligent network comprises predefined service packages consisting of one or more services. Consequently, the block SSF of the mobile services switching center VMSC also maintains the service package records each of which comprises pointers to the trigger records with services corresponding to those included in the service package.

40 In order for the mobile services switching center MSC to be able to recognize a call requiring intelligent network service and to activate the correct triggers for

the service, a new parameter, a subscriber based trigger key, is created in the subscriber data of the mobile subscriber. This trigger key indicates which IN services have been provisioned for the mobile subscriber. Each 5 subscriber may only have one trigger key value of numerical type. Each trigger key value points to one or more triggers for a service, either directly or with reference to the service package comprising the triggers for the desired services. Figure 3 illustrates the latter 10 situation. First, the trigger/triggers are created, and then the service package/packages. After that, the trigger key pointing to the service package can be created. The trigger key can be provided with a value indicating that the trigger key is not used by said mobile subscriber.

15 In the GSM system, the trigger key is created in the mobile subscriber data in the database of the home location register HLR. Its value in the database can be examined and changed by commands of the man-machine language. The trigger key and other subscriber data are 20 transferred by means of the MAP protocol from the home location register HLR to the visitor location register VLR in connection with, for example, location updating. Therefore, in the transfer of the trigger key, a method employed by the supplementary services of the GSM system 25 is used by allocating a supplementary service code for the IN service. The VLR stores, along with other subscriber data, the trigger key value it has obtained from the HLR for possible future use.

30 The trigger key is used for activation of an intelligent network service in both the mobile originating call (MOC) and the mobile terminating call (MTC). In the MTC call, the triggering of an intelligent network service may take place either in the gateway MSC (GMSC) or in the VMSC.

35 The following will illustrate the three situations

by means of Figures 4, 5 and 6.

Figure 4 describes the use of the trigger key according to the invention in a mobile MS originating call. At first, it is assumed that the visitor location register VLR of the mobile services switching center VMSC has stored the trigger key value it has obtained from the home location register HLR of the mobile subscriber in the subscriber data of the mobile subscriber currently located within the VLR area as the mobile station for the first time updates its location to the VLR. As the subscriber places a call from the mobile station MS (step 1), the call control CC of the mobile services switching center VMSC/SSP requests subscriber data of the mobile subscriber from the VLR (step 2). The VLR responds with a message, for example COMPLETE_CALL, which also transfers the trigger key to the call control (step 3). The call control CC locates the trigger key, and informs the service switching function SSF of the trigger key (step 4). The SSF activates those IN service triggers in its memory that point to the service package corresponding to the service key value given (step 5). Alternatively, the SSF may have the triggers in its memory as a trigger table in which the trigger key value points directly to one trigger or a group of several triggers. Following this, the call control CC continues call setup until the call control reaches a phase which is a detection point DP of the ETSI CS_1 basic call state model BCSM, the detection point being an event relating to the call processing. The CC informs the SSF of the encountered detection point DP (step 6). The SSF checks whether any active triggers have been set for this detection point DP. If there are no active triggers for this detection point DP, no IN service need be triggered, and the CC continues call setup forward. If an active trigger is found for this detection point DP, the SSF checks the trigger criteria comprised in

the trigger (step 7). If the trigger criteria comprised in the trigger are fulfilled, the SSF activates the IN service corresponding to the trigger in the service control point SCP whose address the trigger gives (step 8), the IN service being determined by the service key in the trigger. The SCP responds the way the service requires (step 9). Furthermore, the service may require additional communication between the SCP and the SSF. Alternatively, the SCP may send instructions in step 9 concerning call setup to the mobile services switching center VMSC/SSP. The SSF forwards the instructions to the call control CC (step 9) which carries out the required call control function, for example call forwarding (step 11). Steps 9 - 11 may be carried out by the normal principles of the intelligent network model, and it is not necessary to describe them here in any closer detail.

Figure 5 illustrates the use of the trigger key according to the invention in a mobile terminating call (MTC). At first, it is again assumed that the VLR has stored the trigger key value of a mobile subscriber within its area, which value it has obtained from the HLR at some earlier phase. The mobile services switching center VMSC/SSP receives the MTC call (step 1). The call control CC requests of the subscriber data of the called mobile subscriber (step 2) from the VLR, and receives in the response message the trigger key value of the mobile subscriber (step 3). Following this, the mobile services switching center uses the trigger key as in Figure 4. In other words, the CC informs the SSF of the trigger key value (step 4), and the SSF activates the corresponding triggers (step 5). Following this, the CC notifies the SSF every time it encounters a call phase which is a detection point DP of the BCSM model (step 6) and, consequently, the SSF performs the necessary checks in the triggers (step 7) and, if necessary, activates an IN service in a SCP (step

8). Sending of a response message from the SCP to the SSF (step 9), and the consequent call control measures in the mobile services switching center VMSC (steps 10 and 11), may be included in the activated IN service.

5 Figure 6 illustrates the use of the trigger key according to the invention in a mobile MS terminating call (MTC) in a gateway mobile services switching center GMSC. It is assumed that the trigger key value has been determined in the subscriber data of the mobile subscriber
10 in the home location register HLR database. The gateway mobile services switching center GMSC, whose structure according to the invention is similar to the VMSC/SSP except for its gateway function, receives the MTC call (step 1). The GMSC call control CC carries out a routing
15 information enquiry to the home location register HLR of the mobile subscriber by employing the MAP protocol (step 2). The enquiry message may comprise information on the GMSC ability to function as the intelligent network service switching point SSP. The HLR retrieves the
20 subscriber data of the mobile subscriber and checks whether a trigger key value has been defined for the mobile terminating call MTC (step 3). If such a trigger key value does not exist, the HLR proceeds according to the normal procedure of the mobile communication network,
25 which results in the HLR sending a normal routing information to the requesting GMSC. If the HLR detects that the mobile subscriber has a trigger key value defined for the mobile terminating call MTC, the HLR deviates from the normal procedure and checks whether the requesting
30 GMSC is also a service switching point SSP of the intelligent network. This piece of information is provided by the routing information requesting message. If the GMSC is not a SSP, the HLR will proceed according to the normal procedure.

35 If the GMSC is also a SSP, the HLR returns the

trigger key value to the GMSC/SSP center (step 4). The call control CC informs the trigger key value to the SSF (step 5) which activates the triggers corresponding to the trigger key (step 6). The CC continues call control until 5 it meets a detection point DP of the BCSM call model, and the call control CC informs the SSF of the detection point DP (step 7). The SSF performs the checks concerning the triggers as it did in connection with Figures 4 and 5 (step 8), and, if necessary, activates the intelligent 10 network service in a SCP (step 9). The activated service may require both a response from the SCP (step 10) and call control procedures in the mobile services switching center GMSC (steps 11 and 12).

The activated service may be such as to allow the 15 continuing of routing in the normal manner. In such a case, the GMSC must request new routing information from the HLR. The normal operation of the HLR can be ascertained in such a situation, for example, by omitting from the new enquiry the information that the GMSC is also 20 a SSP.

In the above, reference has been made to the CS-1 25 BCSM call model. The reason for the need to model a call lies in the fact that in order to be able to control the IN service, the SCP must know the phase of the call in real time. By modelling, both the SSP and the SCP implicitly know the call phases and possible interaction points where the SCP may have an effect on the call, i.e. the detection points DP. As the call attempt proceeds to the detection point DP, the MSC/SSP will carry out an SCP enquiry in the 30 following cases:

- the DP is a Trigger Detection Point (TDP), and the trigger criteria is fulfilled.
- or the DP is an Event Detection Point (EDP) in which the SCP is interested. The SCP orders the EDPs to be 35 reported on call by call basis.

There are two types of EDPs: "Request" and "Notification". When the SSP makes a SCP enquiry in a detection point DP of the type "Request", the call handling must be suspended, and it is necessary to wait for a response from the SCP.

In the case of a mobile originating call MOC, the following TDPs of the ETSI CS-1 OBCSM call model (Originating Basic Call State Model) can be utilized:

- TDP2: Collected_Info.

In this TDP, the MSC/SSP has received the call setup message either from the MS, PBX or trunk line. In MOC case the Identification, Authorization and the check of basic service has been accomplished before entering this DP. The main triggering criteria in TDP2 is based on the IN category of the calling party, which is included in the subscriber data.

- TDP3: Analyzed_Info.

In this TDP, the MSC has performed the digit analysis, but the call has not been routed yet. Charging analysis has been performed. The main triggering criteria involves the analyzed B-number.

In mobile terminating call MTC case, the TDP of the ETSI CS-1 TBSCM (Terminating Basic Call State Model) call model usable according to the present invention is:

- TDP12: Term_Attempt_Authorized.

In this TDP, the MSC has identified, authenticated and paged the MS. The main triggering criteria is the IN category of the mobile terminating service.

The figures and their description are only intended to illustrate of the present invention. The system and method set forth can be changed and amended without departing from the scope and spirit of the attached claims. For example, the mobile services switching center may also receive the trigger key of the mobile subscriber on the basis of digit analysis of the called subscriber,

19

in an incoming signalling file or in supplementary service information of the exchange.

5

10

15

20

25

30

35

Claims

1. A mobile communication system comprising at least one mobile switching center (MSC, GMSC), mobile subscribers, at least one subscriber database (HLR, VLR) and an intelligent network comprising at least one service switching point (SSP), and at least one service control point (SCP) comprising the database and service logic programmes (SLP) of the intelligent network, whereby the intelligent network contains predefined service triggers, each trigger defining triggering criteria for activating a respective intelligent network service in one of the service control points, characterized in that the mobile services switching center (MSC, GMSC) operates as the service switching point (SSP) of the intelligent network, and the service control point (SCP) is implemented as a functional unit independent of the mobile services switching center, and communicates with the mobile services switching center by means of the intelligent network interface and the intelligent network protocol (Core INAP),

the subscriber data of a mobile subscriber entitled to intelligent network services in said at least one subscriber database (HLR, VLR) includes a service trigger key pointing to one or more service triggers,

the mobile services switching center is arranged to react to the service trigger key of the mobile subscriber during call setup by retrieving one or more triggers pointed to by the trigger key, and by triggering an intelligent network service corresponding to said retrieved trigger in one of the service control points (SCP) as the triggering criteria of the trigger are met.

2. A mobile communication network as claimed in claim 1, characterized in that the mobile services switching center (MSC, GMSC) comprises the

triggers and the trigger keys of the intelligent network in form of a table in which each trigger key points to one or more triggers.

3. A mobile communication network as claimed in
5 claim 1 or 2, characterized by predefined service packages for one or more services in the intelligent network, each package having a dedicated trigger key.

4. A mobile communication network as claimed in any
10 one of the previous claims, characterized in that the mobile services switching center comprises

a call control point (CCP) taking care of the intelligent network call,

15 a service switching function (SSF) having the ability to communicate with the service control point (SCP) by using a standard intelligent network protocol (INAP), and with the call control by using an internal interface.

20 5. A method for activating an intelligent network service in a mobile communication network comprising at least one mobile switching center, mobile subscribers, at least one subscriber database and an intelligent network comprising at least one service switching point, and at least one service control point comprising a database and
25 service logic programmes of the intelligent network, the method comprising steps of

30 maintaining in the intelligent network predefined service triggers, each trigger defining triggering criteria for activating a respective intelligent network service in one of the service control points, characterized by

providing the mobile subscriber entitled to intelligent network services with a trigger key which points to one or more service triggers,

35 maintaining the triggers in the mobile services

switching center so that they can be activated by the trigger keys,

activating in the mobile services switching center,
in conjunction with an intelligent network call, those of
5 the triggers pointed to by the trigger key of the mobile
subscriber,

triggering the intelligent network service
corresponding to the trigger in one of the service control
10 points as the triggering criteria of the trigger are met
in the mobile services switching center.

6. A method as claimed in claim 5,
characterized by obtaining, at the mobile
services switching center, the trigger key of the mobile
15 subscriber as a result of analysis of a directory number
of a called subscriber, in an incoming signalling file or
in supplementary service information of a private branch
exchange.

7. A method as claimed in claim 5,
characterized by

20 storing the trigger key of the mobile subscriber
entitled to intelligent network services in the subscriber
data of said at least one subscriber database,

transferring the trigger key from said at least one
25 subscriber database to the mobile services switching
center during call setup,

activating in the mobile services switching center
those triggers to which the trigger keys point,

triggering the intelligent network service
corresponding to the trigger in one of the specific
30 service control points as the triggering criteria are met
in the mobile services switching center.

8. A method as claimed in claim 8,
characterized by the activation of an
intelligent network service in a mobile originating call
35 comprising the following steps:

- initiating the call setup by the mobile subscriber,
carrying out by the mobile services switching
center an enquiry to the subscriber database,
sending the trigger key from the subscriber
5 database to the mobile services switching center in a
response,
activating by the mobile services switching center
the triggers pointed to by the trigger key,
triggering by the mobile services switching center
10 the intelligent network service corresponding to the
trigger in one of the specific service control points,
when the triggering criteria are met in the mobile
services switching center.
9. A method as claimed in claim 9,
15 characterized by the activation of an
intelligent network service in a mobile terminating call
comprising the following steps:
receiving, at the mobile services switching center,
the mobile terminating call,
20 carrying out by the mobile services switching
center an enquiry to the subscriber database,
sending the trigger key from the subscriber
database to the mobile services switching center in a
response,
25 activating by the mobile services switching center
the triggers pointed to by the trigger key,
triggering by the mobile services switching center
the intelligent network service corresponding to the
trigger in one of the service control points as the
30 triggering criteria are met in the mobile services
switching center.
10. A method as claimed in claim 5,
characterized by the activation of an
intelligent network service in a mobile terminating call
35 comprising in the gateway mobile services switching center

- of the mobile communication network the following steps:
receiving, at the gateway mobile services switching center, the mobile terminating call,
carrying out by the gateway mobile services switching center a routing information enquiry to the subscriber database,
detecting by the subscriber database the trigger key in the subscriber data of the mobile subscriber,
sending the trigger key, instead of the routing information, from the subscriber database to the gateway mobile services switching center,
activating by the gateway mobile services switching center the triggers pointed to by the trigger key,
triggering by the gateway mobile services switching center the intelligent network service corresponding to the trigger in a specific service control point, when the triggering criteria are met in the gateway mobile services switching center.
11. A method as claimed in claim 10, characterized by
transferring, in the routing information enquiry, information on whether the gateway mobile services switching center is able to function as the service switching point of the intelligent network,
sending the trigger key from the subscriber database to the gateway mobile services switching center, if it is able to function as the service switching point of the intelligent network,
sending the normal routing information from the subscriber database to the gateway mobile services switching center, if it is not able to function as the service switching point of the intelligent network.
12. A method as claimed in any one of claims 5 - 11, characterized in that the trigger includes the control point address of the service, the service key,

the trigger priority, the call model detection point in which the service can be activated, and the triggering criteria.

5 13. A method as claimed in claim 12, characterized by

detecting by the mobile services switching center the detection point of the call model,

10 checking by the mobile services switching center whether there are active triggers set for the detection point of said call model,

 checking by the mobile services switching center whether the active trigger is in use and whether the triggering criteria are met,

15 activating by the mobile services switching center the intelligent network service by sending an activation message to the service control point, if the triggering criteria are met.

20 14. A method as claimed in claim 5, characterized by

 storing the triggers in the mobile services switching center in form of a trigger table indexed by the trigger keys,

25 activating the triggers by retrieving those triggers in the trigger table pointed to by the trigger key.

30 15. A method as claimed in claim 5, characterized by predefined service packages, each package consisting of one or more intelligent network services, and having a dedicated trigger key.

35 16. A method as claimed in claim 5 in a mobile communication network whose subscriber databases comprise at least one home location register and at least one visitor location register, characterized by transferring the trigger key from the home location register to the visitor location register during location

26

updating.

5

10

15

20

25

30

35

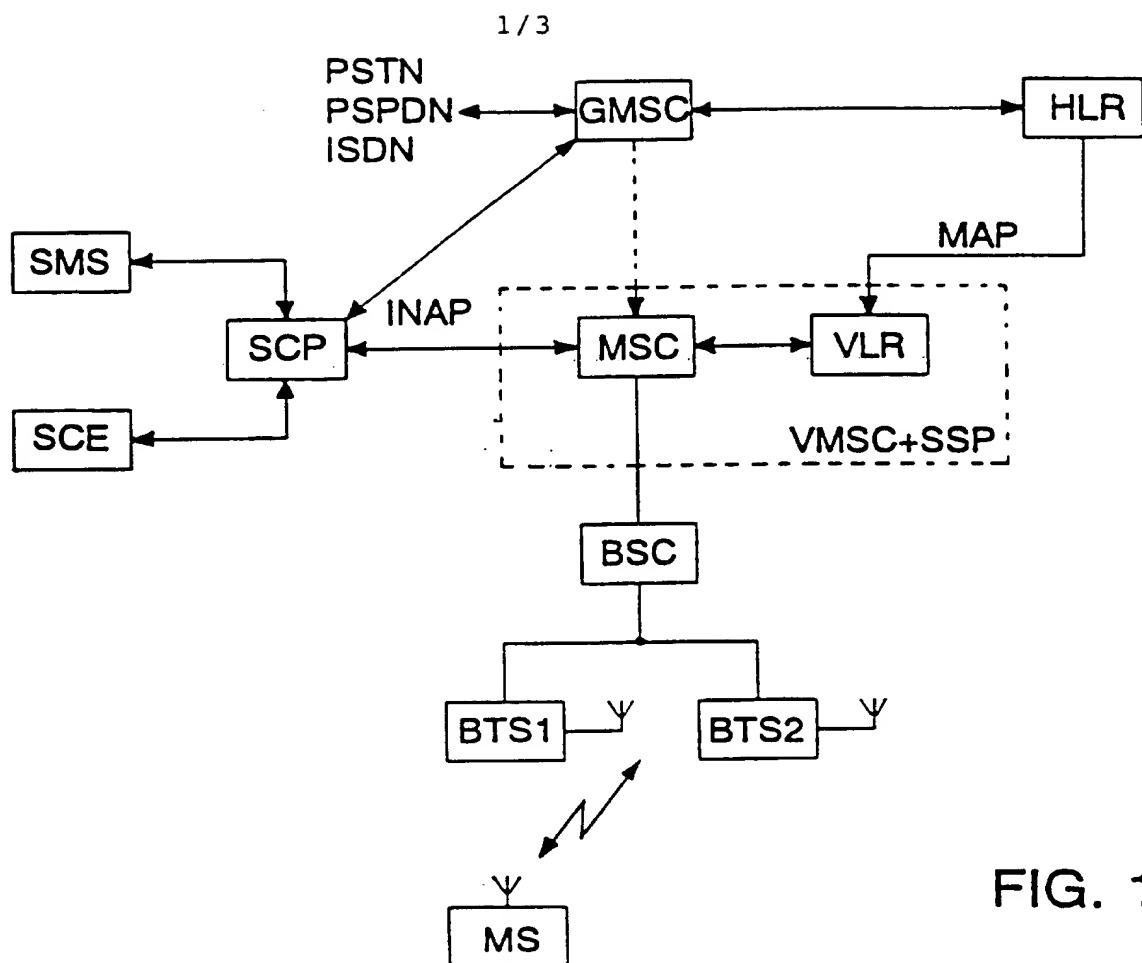


FIG. 1

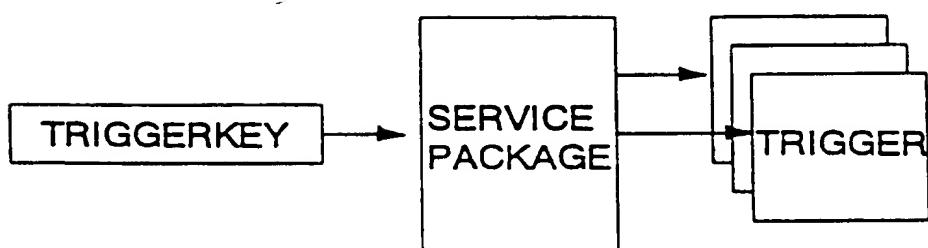


FIG. 3

2 / 3

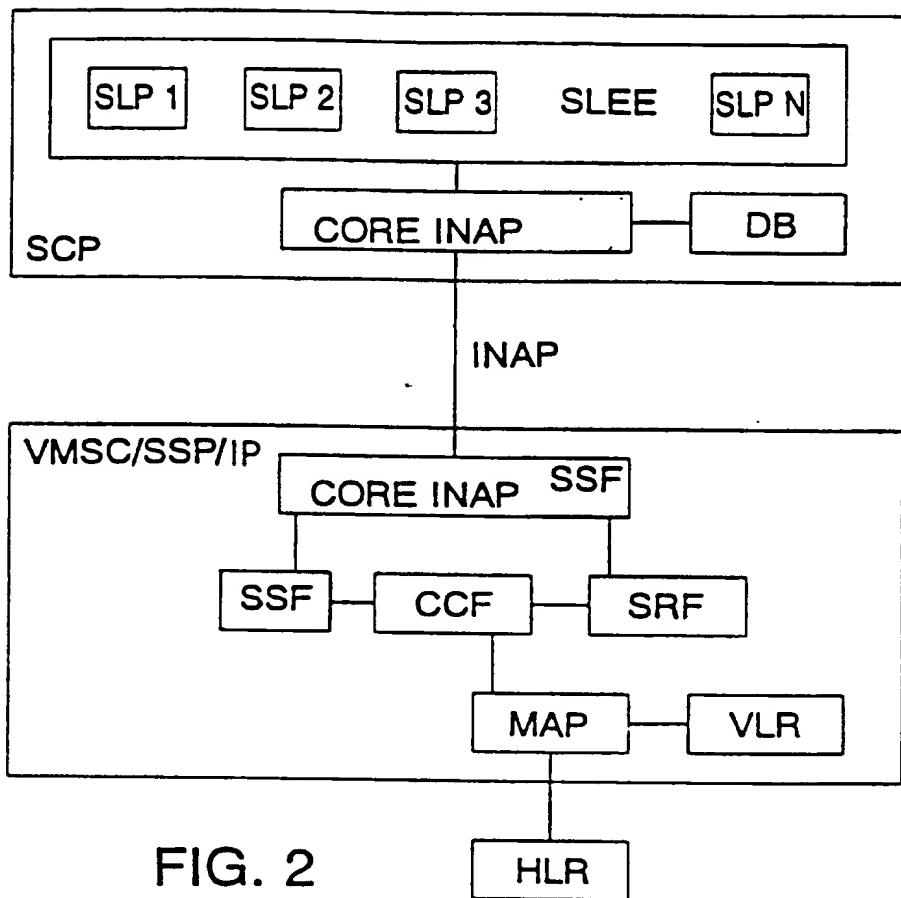
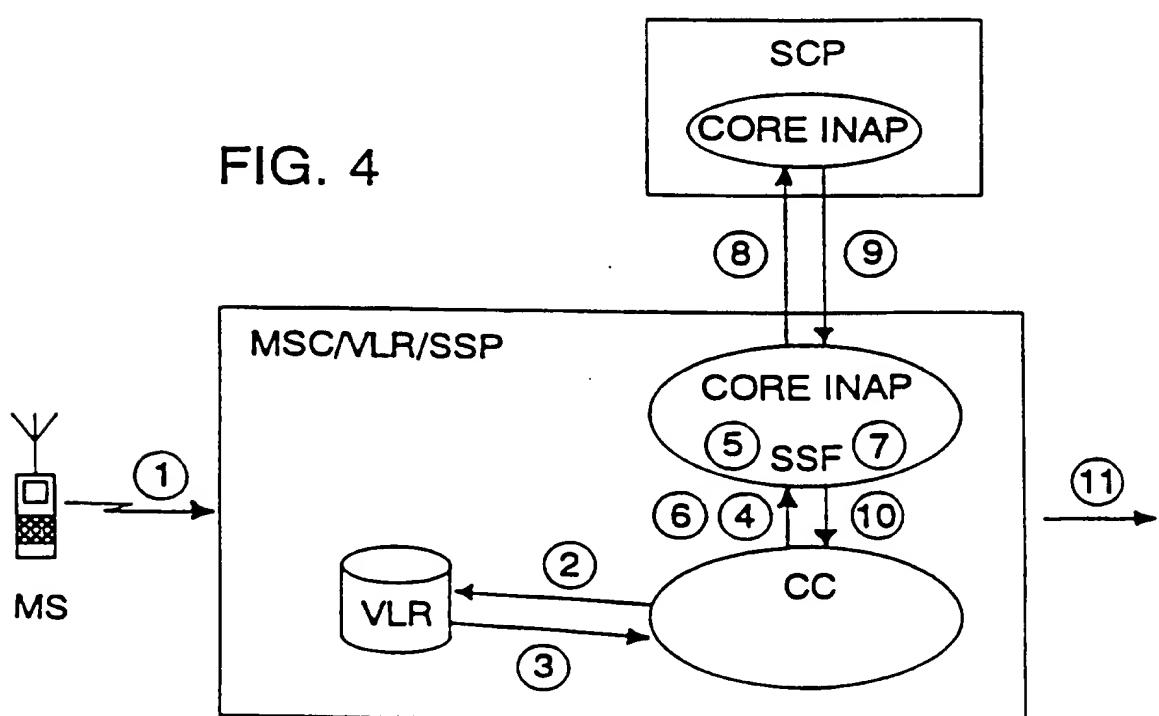


FIG. 2



3 / 3

FIG. 6

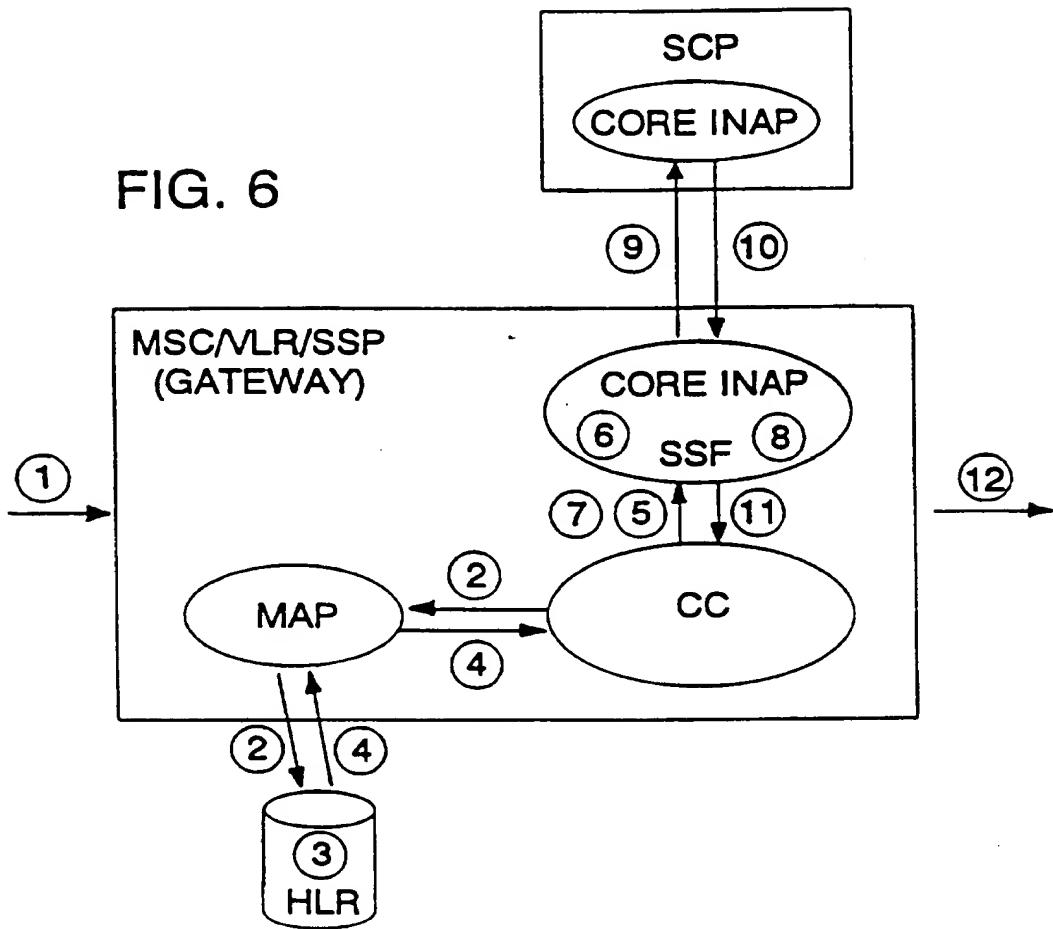
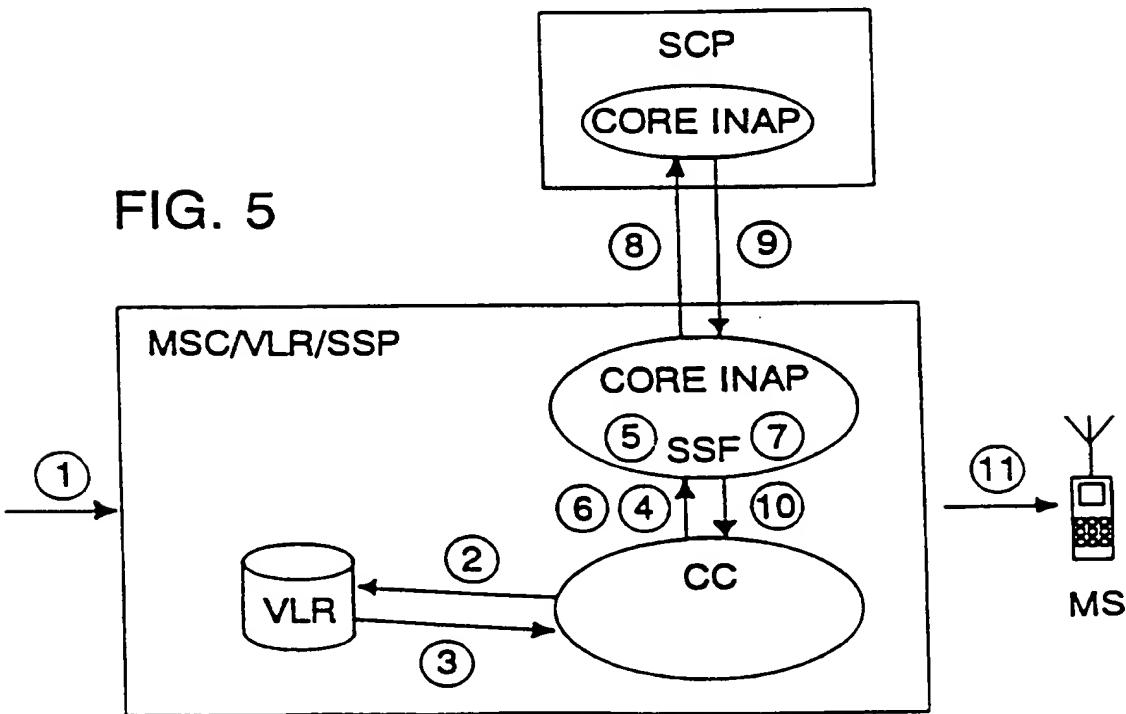


FIG. 5



INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 95/00601

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04Q 7/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04Q, H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	WO 9526114 A1 (TELEFONAKTIEBOLAGET LM ERICSSON), 28 Sept 1995 (28.09.95), page 12, line 28 - page 13, line 15; page 28, line 7 - line 35 --	1-2,4-11,16
X	WO 9318606 A1 (BELL ATLANTIC NETWORK SERVICES, INC.), 16 Sept 1993 (16.09.93), page 22, line 10 - line 31; page 27, line 17 - page 28, line 17; page 30, line 13 - line 34, page 44, line 10-33 page 57, line 15-29 page 59, line 13-27 -----	1-2,4-11,16



Further documents are listed in the continuation of Box C.



See patent family annex.

- * Special categories of cited documents:
 - "A" document defining the general state of the art which is not considered to be of particular relevance
 - "B" earlier document but published on or after the international filing date
 - "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
 - "O" document referring to an oral disclosure, use, exhibition or other means
 - "P" document published prior to the international filing date but later than the priority date claimed
- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search

2 April 1994

Date of mailing of the international search report

09 -04- 1996

Name and mailing address of the ISA/
Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM
Facsimile No. + 46 8 666 02 86

Authorized officer

Peter Hedman
Telephone No. + 46 8 782 25 00

INTERNATIONAL SEARCH REPORT
Information on patent family members

05/02/96

International application No.
PCT/FI 95/00601

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
WO-A1- 9526114	28/09/95	NONE		
WO-A1- 9318606	16/09/93	US-A-	5353331	04/10/94
		US-A-	5469496	21/11/95